A NEURO-PATHOLOGIC STUDY ON CHRONIC GASTRITIS, GASTRIC ULCER AND GASTRIC CANCER

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A NEURO-PATHOLOGIC STUDY ON CHRONIC GASTRITIS, GASTRIC ULCER AND GASTRIC CANCER

by

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I. INTRODUCTION

In the recent advance of neurohistologic techniques, a new peripheral structure of the vegetative nervous system has been described by BOEKE, STOEHR, REISER, JAEONERO, SETO and others.

Their interpretations on this structure do not always agree with each other, but at least their opinions are coincidental in the following point, i. e, the vegetative nerves finally form a nervous network like the vascular capillary nets, which never show free terminations.

On the basis of these opinions, Prof. SETO (Tohoku University) gave a new defnition on the visceral sensory nerves ; he demonstrated a special form of the visceral sensory nerves which are much thicker than the vegetative nerves and always terminate in free endings. These visceral sensory nerves (SETO) were found by him in the esophagus, stomach, duodenum and anus in the alimental canals.

Later, A. OTSU, K. MAKINO, N. INOUE, I. M. LEE and WANG of our clinic also observed these nerves in all other portions of the alimentary canal. They proved, by degeneration experiments, that these nerves have their nerve cells in the spinal ganglions or in the vagus trunk, and one single neuron reaches its effector tissues without having any relay stations on the way.

According to them, the distribution of these nerves coincides exactly with the results of the physiologic experiments on the visceral sensitivity by KIMURA.

Thus, the sensory nature of SETO's nerve has found a more trustworthy ground to rely upon.

As for the pathologic changes of the visceral nerves, Sunder-Plassmann has reported the degeneration of terminal networks following a section of the sympathetic trunk at the level of the cervical portion. Stoehr and Reiser have found some degenerated axis cylinders in the stomach with the gastric ulcer, and K. MAKINO has observed the hyperplasy of the sensory nerves in the mucous membrane of a painful duodenal diverticle.

However, reports on the neuropathologic change of the viscera, especially concerning the sensory nerves are rather rare.

Clinically, it is very important to solve the problem of the abdominal pain from the neuro-pathologic point of view. For this purpose, the author has studied in the present report the pathologic changes of the visceral nerves by chronic

gastritis, gastric ulcers and cancers of the stomach.

II. MATERIALS AND METHODS

According to KIMURA, the pylorus is most sensitive to stimulations than all other parts of the stomach. Therefore, the author studied the changes of the nervous structures in the pylorus.

Some of the resected stomachs had the ulcer or cancer in the pylorus and others had the focus in other parts of the stomach. In some cases, in the author's study, pathologic changes of the nervous structures were observed within the ulcerous and the cancerous tissues of the pyloric portions, while in other cases, changes in the surrounding or remote areas of the focus were observed.

As the author wished to obtain the materials as fresh as possible, gastric resections were carefully perfomed keeping the blood supply in the pyloric portions until the removal of the stomach. The pyloric portions were cut off from the removed stomachs, immersed immediately in 10% neutral formalin solution and were fixed for 3 or 4 weeks.

These specimens were sliced with the freezing method and the sections were further fixed in the formalin solution mentioned above for 6 months, and then they were stained.

The axis cylinder of the nerve was stained with Seto's modification of Bielschowsky's silver impregnation, and the myelin sheath was stained with Ehrlich's acid hematoxylin method.

On the other hand, a part of these specimens was stained with the hematoxylin-eosin method. The author studied on what grounds the nervous changes occurred by comparing the silver impregnated specimens with those stained with the hematoxylin-eosin method.

III. NERVES IN THE PYLORUS OF THE CHRONIC GASTRITIS AND GASTRIC ULCERS

The nerve fibers in the pylorus of both chronic gastritis and gastric ulcers showed various changes, i. e, hyperplasy (thick and heavy stained fibers in whole length), nodular swellings or partial severances with vacuoles.

The nervous syncytia by Jabonero or the "Leitplasmodium" by Stoehr fell into the granular change or dark swelling in places. These abnormal appearances of the nerve fibers may be considered as a stimulated or degenerated state.

Fig. I shows a degenertaed preterminal network in the Meissner's plexus. Slender nerve fibers are swollen in places with vacuoles. At the confluence of the nervous syncytia, there is a nerve cell which seems to be the Dogiel's 2nd type.

According to Jabonero, these kinds of nerve cells, which give rise to nervous syncytia exclusively, keep only in contact, but not connected, with the postganglionic fibers.

The nerve cell seen in Fig. 1 still kept its delicate neurofibrils, and the outline

of the cell body and the nucleus suggests its normality.

Fig. 4 shows the change of the vegetative fibers at the basis of a gastric ulcer.

As Stoehr has already described, the vegetative terminal networks develop more abundantly in the ulcer tissues infiltrated by the round cells than the normal one. However, the nerve fibers within the nervous syncytia do not form such a delicate network as in the normal stomach, and somewhat swollen fibers run sparsely along the nervous syncytia. Thick sensory nerves with varicosities are rather numerously and easily found in this case, because they are thickened by hyperplasy or swelling.

Fig. 6 & 7 show such a thickened sensory ending accompanied by a nervous syncytium in the muscularis mucosae. The abnormal thickness in places must be due to the swelling caused by the stimulation of the chronic inflammation. These thick fibers are often found in the mucous membrane of the gastric ulcer and their myelin sheath is still kept in such a peripheral area (fig. 8).

Fig. 9 shows a thick myelinated fiber stained with Ehrlich's method in the mucous membrane of a gastric ulcer. After repeating the bichotomic arborizations they become thinner and thinner, lose their myelin sheath, and then disappear between the crypts in free endings. This suggests that they are hyperplastic sensory nerves as described by A. Otsu.

Fig. 10 also shows a myelinated nerve in the submucous layer, looking almost normal, but in some portions it gives poor stainability.

In some places vacuol buildings or partial severances (Fig. 11), while in other places very thick nerves looking rather hyperplastic (Fig. 12), are observable in the mucous membrane.

Fig. 13 & 14 show an intramural nerve cell and a sensory nerve passing near by. The impregnability of the cell body is partially reduced, but the nuclei of the accessory plasmodium present the normal distribution. The sensory nerve fiber has no relation to this nerve cell.

Fig. 15 & 16 show a proliferated vegetative preterminal and terminal nework in the mucous membrane of the same specimen.

IV. NERVES IN THE CANCER OF THE STOMACH

The neuropathologic changes in cancer of the stomach are divided into two kinds: the change in the surrounding area and that in the central portion of the cancer. The changes of the surrounding areas are identical with those of the chronic gastritis and gastric ulcers, and the characteristic changes of the cancer are found at the central area. The author, therefore, will describe the neuropathologic observations of these two areas seperately.

A. The Neuropathologic Change in the Surrounding Area of the Cancer.

In the surrounding area, the nervous changes are attributed to the stimulated state caused by the inflammation occurring around the cancer. The stimulation of the the chronic inflammation of the visceral nerves causes first hyperplasy and then degeneration.

Fig. 17 shows a proliferated vegetative terminal network with granular

degeneration in the Meissner's plexus. The thick fiber contains vacuoles and swellings (Fig. 22).

A part of Fig. 17 is enlarged as shown in Fig. 18 where two nerve cells of the Dogiel's 2nd type with deeply stained nuclei are surrounded by the nervous network.

Fig. 17, 18 & 19 present the process of the pathologic change of the vegetative nervous network, i. e. from the early proliferation to the later destroyance. The nerve fibers swell in places showing beads or granules in the nervous syncytia and finally the outline of the syncytia disappear. (Fig. 21).

Fig. 20 shows the vacuolated fibers in the swollen vegetative network in the muscularis mucosae. Observations near the Meissner's plexus are also illustrated by the sketch in Fig. 23.

Fig. 24 & 25 show the preterminal network, in which nerve fibers seem to be hyperplastic, but it lacks the delicate network structure, and the syncytia give an aspect of dark swelling. Also vacuoles appear in places in the swollen nerve fibers of the vegetative nervous networks (Fig. 22).

In the AUERBACH'S plexus, the nerve cells of the DOGIEL'S 1st type decrease in number, and many of the nerve cells in the field are the light coloured Dogiel's 2nd type.

The vegetative preterminal and terminal networks often present a dark swelling in which the nerve fibers are swollen, and are ragged in places (Fig. 24 & 25).

The vegetative networks in the muscularis mucosae (Fig. 26), in the submucosa (Fig. 27) and in the mucous membrane (Fig. 28, 29 & 30) are apparently proliferated, but contain various degenerated figures, i. e. swelling or granular changes of fibers making large patterns.

Fig. 31 & 32 show a intramural nerve cell in the tunica muscularis mucosae connected with the degenerated vegetative nervous network. Many of the sensory nerves in the mucous membrane are rather markedly observable due to their thickened and hyperchromatic aspects. (Fig. 33, 34 & 35)

Some of them may be normal (Fig. 35 & 37), but the nerve fiber in Fig. 33 contains vacuoles. Even near the mucous glands they run as a thinner fiber without changing into a network. (Fig. 38 & 39)

Fig. 39 shows a sensory fiber running along the vegetative syncytium near the mucous glands (dark area).

This is quite different from the vegetative peripheral nerves typical of which is shown in Fig, 40. In Fig. 40 & 41 a syncytium is traced to a Schwann's nucleus lying very close to a mucous gland.

Fig. 42 shows a myelinated fiber in the muscle layer, the swellings of which suggest the early stage of degeneration.

B. The Neuropathologic Change in the Central Area of Stomach Cancer

At the center of the stomach cancer, the nervous structures present various pathologic changes.

The vegetative networks and the vegetative syncytia disappear amidst the

infiltration of the carcinoma cells.

Fig. 44 & 45 show fairly normal sensory fibers in the muscularis mucosae infiltrated by adenocarcinoma, and Fig. 46 & 47 are the sensory nerves in the submucous layer of the same specimen presenting swellings in their course.

Fig. 48 shows a specimen of the carcinoma simplex. 2 thick nerve fibers run across the field, where the normal tissue partially is replaced by the cancer cells. In such a pathologic field some nerve fibers are still able to keep an almost normal appearance.

In the Meissner's plexus, nerve cells are scatttered. Some of them as observed in Fig. 49 & 50 are fallen into serious degeneration presenting a dim outline of the cell body, a granular change of neuroplasme, and disappearance of nerve process.

The sensory nerves in the submucous layer of the same specimen show swellings in places as in Fig. 51 & 52. Fig. 53 shows a sensory fiber near the mucous gland.

Fig. 54 & 55 show the nerve fibers in the midst of the carcinomatous cells of the gelatinous cancer. In such a soft carcinomatous tissue almost normal nerve fibers are observable. In other words, the nerves have a tendency to remain normal in the soft tissue, though it is subjected to cancer. Sometimes, the nerve fibers are pressed by the hard carcinoma cells and they seem to make a detour around them.

The nerves in Fig. 56 & 57 are the degenerated fibers found in the submucous layer of a cylinder cell carcinoma. They are dim, severed and swollen in places, presenting later stages of degeneration. Even in the spongy tissues of the same specimen some nerves are changed into granules arrayed along the course as shown in Fig. 58, and Fig. 59 may represent an early state of such a degenerative process.

The glandular structure of an adenocarcinoma, which shows almost the same aspect as the normal one in the hematoxylin-eosin staining (Fig. 59'), gives a characteristic change in the silver impregnated specimen, i. e. the lack of argyrophil cells in the mucous gland (Fig. 60).

These argyrophil cells are considered to have a close relation to the vegetative nervous system. Therefore, the disappearance of the vegetative networks, vegetative syncytia, and the argyrophil cells suggest that in the growth of the carcinoma the peripheral structure of the vegetative nervous system is destroyed.

On the other hand, the nerve fibers, which do not make a vegetative network, are more resistant against carcinomatous infiltrations.

A sensory nerve is deeply stained in the carcinomatous infiltration in the muscularis mucosae of an adenocarcinoma, and it also presents partial swellings with vacuoles as shown in Fig. 43.

V. DISCUSSION

The author has studied the neuropathologic changes in the specimens of chronic gastritis, gastric ulcer and gastric cancer.

In chronic gastritis and gastric ulcer the visceral nerves present stimulated

figures such as hyperplasy or proliferation at first and degeneration later.

1. Chronic Gastritis and Gastric Ulcer

a) Hyperplasy of the nervous structures.

The sensory fibers increase their thickness and show deep coloured figures in the silver impregnated specimens, and the myelin sheath is more marked even in the mucous membrane with Ehrlch's acid hematoxylin staining. With the proliferation of the vegetative nervous periphery, numerous nervous syncytia, preterminal and terminal networks are observed. Each syncytium increases its width, and looks darker and the fibers of which seem thicker.

b) Degeneration of the nervous structures.

On the other hand, the author has found various degenerative changes of the visceral nerves in gastric ulcers and chronic gastritis. Both the thick sensory fibers and the slender autonomic fibers showed swellings, partial severances, poor stainability or vacuol building in places. The nervous syncytia were sometimes stained with a dark colour keeping many vacuoles within them, while in other parts they looked dim. For instance, at a portion near the gastric ulcer they were well developed, but at the bottom of the ulcer the fine structures of the fibers changed into large meshworks without wearing syncytia, and which looked worn to rags here and there.

Concerning the nerve cells in the Meissner's and the Auerbach's plexus, the cells belonging to the Dogiel's 1st type decreased in number and the 2nd type appeared predominantly. Most nerve cells scattered in the submucous layer were light coloured cells having no connection with the thick neurites around them. The author considered therefore, that the nerve cells of the Dogiel's 1st type were less resistant against chronic inflammation than the 2nd type.

In chronic gastritis the vegetative nervous structures presented more remarkable changes in the Meissner's plexus than in the Auerbach's plexus. This tendency was not distinct in gastric ulcers.

Supposing chronic gastritis causes the inflammation of the mucous membrane, the heavy nervous damage that appeared in the Meissner's plexus is well understood as a matter of course.

Observing these various changes of the visceral nerves the author has come to the conclusion that they are always stimulated by the chronic inflammations causing hyperplasy at first and then gradual degeneration.

2. Cancer of the Stomach.

The neuropathologic changes appearing in cancer of the stomach are divided by the author into two kinds ; one observed in the surrounding area and the other at the center of the cancer. As for the former, the author recognized it to be similar to those of the chronic inflammations.

At the center of the gastric cancer the author has found a characteristic change of the nerves. No special peripheral structure of the vegetative nerves was found, and neither vegetative nervous networks nor nervous syncytia were found in the cancerous tissues.

Nerve fibers, not consisting of the vegetative network, were well observed in the carcinomatous infiltrations, but some of them were in high degree of degeneration.

The normal figure of those nerve fibers was mostly found in such a soft cancer tissue as the gelatinous cancer, but rarely in the hard infiltration of the cancer cells like the carcinoma simplex. This suggests that nervous damage in carcinoma is mainly due to the pressure of the cancer cells causing the dystrophy of the visceral nerves.

The argyrophile cells, in which FEYRTER suposed a sort of vegetative nervous structure in the periphery, lacked in the glandular formations of the adenocarcinoma. From the viewpoint of the argyrophile cells the adenocarcinoma is quite different from the normal glands.

In agreement with FEYRTER's opinion and considering the early disappearance of vegetative nervous networks and syncytia in the cancer tissue, it may be said that cancer grows under the poor control of the vegetative nervous system.

VI. CONCLUSION

From the present neuropathologic study on the chronic gastritis, the gastric ulcer and the gastric cancer, the author has come to the following conclusions.

1. The stimulation of the chronic gastritis and the gastric ulcer caused at first the hyperplasy of the visceral nerves and later the degeneration. The same figures appear in the surrounding area of the gastric cancer. In these cases the peripheral networks of the vegetative nervous system always show proliferation.

2. In the case of the chronic gastritis a remarkable proliferation occurrs in the winding territory and preterminal network.

3. At the center of the gastric cancer, the nervous elements usually fall in serious degeneration.

4. But in the midst of the cancer tissue, visceral nerve fibers are not always destroyed. For instance, in the gelatinous cancer nerves run through the cancer tissue, while in the carcinoma simplex they are traced along the soft connective tissues around the cell groups of the cancer. From this point of view, the destroyance of the nerve fibers in the cancer tissue is attributed to dystrophy due to the mechanical pressure of the cancer infiltrations.

5. The special vegetative nervous structures in the periphery, such as the preterminal-, terminal network or nervous syncytium disappears from the cancer tissue in an early stage.

6. The argyrophile cell in the mucous gland does not exist in the glandular formation of the adenocarcinoma.

7. The degenerated sensory nerve fibers in the chronic inflammations and the cancers of the stomach show hyperplasy, partial swellings, severances, vacuol buildings, and hyper- or hypochromasy, while main changes of the autonomic nerve structures in the chronic inflammations are proliferation and dark swelling of the syncytia or the granular degeneration of the network, and disappearance of them in cancer.

Illustration of figures.

Fig. 1) Dark swelling of the preterminal networks with a nerve cell belonging to 1st type by Dogiel.

Fig. 2) Enlarged picture of the preterminal network in Fig. 1. The dark coloured and thickened nervous syncytia.

Fig. 3) Sketch of Fig. 1. Granular degeneration and partial swellings of fibers in the nervous networks.

Fig. 4) Proliferated preterminal networks and a thick sensory fiber.

Fig. 5) Sketch of Fig. 4.

Fig. 6) A peripheral figure of a sensory nerve near its termination in the muscularis mucosae of gastric ulcer.

Fig. 7) Sketch of Fig. 6, Partial swelling of a sensory fiber.

Fig. 8) A hypesrplasted sensory nerve in the tunica muscularis mucosae of a gastric ulcer. Bielschowsky's silver impregnation ×150

Fig. 9) A hyperplasted myelinated sensory fiber in the tunica propria mucosae of a gastric ulcer. Ehrlich's acid hematoxlin method ×60

Fig. 10) A myelinated sensory fiber in the submucous layer of a gastric ulcer. Partial hypochromasy and swelling of the myelin-sheath.

Fig. 11) A normal myelinated sensory fiber found at the bottom of a gastric ulcer. Ehrlich's acid hematoxylin method. ×400

Fig. 12) A sensory fiber near its ending in the mucous membrane of a gastric ulcer. Bielschowsky's silver impregnation ×400

Fig. 13) A nerve cell of the 2nd type by Dogiel and a sensory nerve passing by in the Meissner's plexus of a gastric ulcer, Bielschowsky's silver impregnation ×400

Fig. 14) Sketch of Fig. 13.

Fig. 15) A proliferated preterminal network in the mucous membrane of a gastric ulcer. Bielschowsky's silver impregnation. ×400

Fig. 16) Enlarged picture of Fig. 15.

Fig. 17) Proliferated preterminal- and terminal- network in the Meissner's plexus in the surrounding area of a gastric cancer. Bielschowsky's silver impregnation. ×400

Fig. 18) Nerve cells of the 2nd type by Dogiel in the same specimen of Fig. 17.

Fig. 19) A part of the proliferated preterminal network in Meissner's plexus in the surrounding area of a gastric cancer. The nervous syncytium is widened and contains granulated fibers within it. Bielschowsky's silver impregnation. ×600

Fig. 20) A surrounding part of a gastric cancer. A proliferated syncytium keeps many granles due to the heavy degeneration of nerve fibers within it. Bielschowsky's silver impregnation ×600

Fig. 21) A surrounding area of a gastric cancer. Granular degeneration of the visceral nerves in the muscularis mucosae. Bielschowsky's silver impregnation ×600

Fig. 22) A surrounding area of a gastric cancer. Vacuoles in the swellings of degenerated fibers in the preterminal network in muscularis mucosae. Bielschowsky's silver impregnation ×600

Fig. 23) Sketch of Fig. 22.

Fig. 24) A surrounding area of a gastric cancer. Proliferated preterminal network in the Meissner's plexus. Syncytia show dark swelling and fibers are thickened and seem to be worn to rags. Bielschowsky's silver impregnation ×600

Fig. 25) Proliferated terminal network in the Meissner plexus of the same specimen as Fig. 24. Fibers are thickened and the figure of meshworks is not distinct. Bielschowsky's silver impregnation. ×400

Fig. 26) A surrounding area of a gastric cancer. Proliferated terminal network in the muscularis mucosae. Fibers are partially swollen and worn to rags. Bielschowsky's silver impregnation. ×400

Fig. 27) Proliferated terminal network in the submucous layer of the specimen as in Fig. 26. Bielschowsky's silver impregnation. ×400

Fig. 28) A surrounding area of a gastric cancer, Granular degeneration of the terminal networks.

Bielschowsky's silver impregnation. ×600

Fig. 29) Sketch of the same figures shown in Fig. 28.

Fig. 30) Sketch showing another part of Fig. 28.

Fig. 31) A surrounding area of a gastric cancer. An intramural ganglion cell which appeared in muscularis mucosae. Bierschowsky's silver impregnation. ×100

Fig. 32) Sketch of Fig. 31. Granular degeneration of terminal network around the nerve cell.

Fig. 33) A surrounding area of a gastric

cancer. Hyperchromasy of a sensory nerve in muscularis mucosae. Bielschowsky's silver impregnation. ×600

Fig. 34) Sketch of Fig. 33. Dotted lines along the course of the sensory nerve present the granules changed from autonomic nerve fibers.

Fig. 35) A surrounding area of a gastric cancer. Almost normal appearnce of a sensory nerve in muscularis mucosae. Bielschowsky's silver impregnation. ×400

Fig. 36) A surrounding area of a gastric cancer. A sensory nerve of normal appearance accompained by vegetative preterminal network. Bielschowsky's silver impregnation. ×400

Fig. 37) A surrounding area of a gastric cancer. A normal sensory fiber in the muscle layer. Bielschowsky's silver impregnation. ×100

Fig. 38) A surrounding area of a gastric cancer. A normal sensory nerve in the mucous membrane. Bielschowsky's silver impregnation. ×400

Fig. 39) Enlarged picture of Fig. 38. A swollen tortuous sensory fiber accompanied by the vegetative networks. Bielschowsky's silver impregnation. ×400

Fig. 40) A surrounding area of a gastric cancer. A nervous syncytium communicating a Schwan's nucleus lying close to a moucous gland. Bielschowsky's silver impregnation. ×1000

Fig. 41) Sketch of Fig. 40.

Fig. 42) A surrounding area of a gastric cancer. A myelinated fiber in an early stage of degeneration in the muscle layer.
Ehrlich's acid hematoxylin method. ×400

Fig. 43) A central area of a gastric cancer. A sensory nerve ending in muscularis mucosae. Bielschowsky's silver impregnation. ×400

Fig. 44) A central area of a gastric cancer. A sensory fiber near its ending in the muscularis mucosae showing normal figure.
Bielschowsky's silver impregnation. ×400

Fig. 45) A central area of a gastric cancer. Another sensory fiber in the muscularis mucosae observed in the same specimen as Fig. 44. Bielschowsky's silver impregnation. ×400

Fig. 46) A central area of a gastric cancer. The partial swelling of a sensory nerve in the submucous layer. Bielschowsky's silver impregnation. ×400

Fig. 47) Sketch of Fig. 46.

Fig. 48) A central area of a gastric cancer. The hyperplastic sensory nerves observed in the muscularis mucosae infiltrated by carcinoma simplex. Bielschowsky's silver impregnation ×400

Fig. 49) A degenerated nerve cell and a thick nerve fiber in the Meissner's plexus of a carcinoma simplex. Bielschowsky's silver impregnation. ×400

Fig. 50) Sketch of Fig. 49.

Fig. 51) A hyperplastic sensory nerve found in the Meissner's plexus of a carcinoma simplex. Bielschowsky's silver impregnation. ×400

Fig. 52) Another sensory nerve in the Meissner's plexus changing from hyperplasy to partial swelling in the same specimen as Fig. 51.

Fig. 53) Swelling of a sensory nerve in the Meissner's plexus found in the same specimen as Fig. 51 & 52.

Fig. 54) Normal sensory nerves running through muscularis mucosae infiltrated by the gellatinous cancer cells. Bielschowsky's silver impregnation. ×400

Fig. 54) Gelatinous cancer. Hematoxylin-Eosin Stain

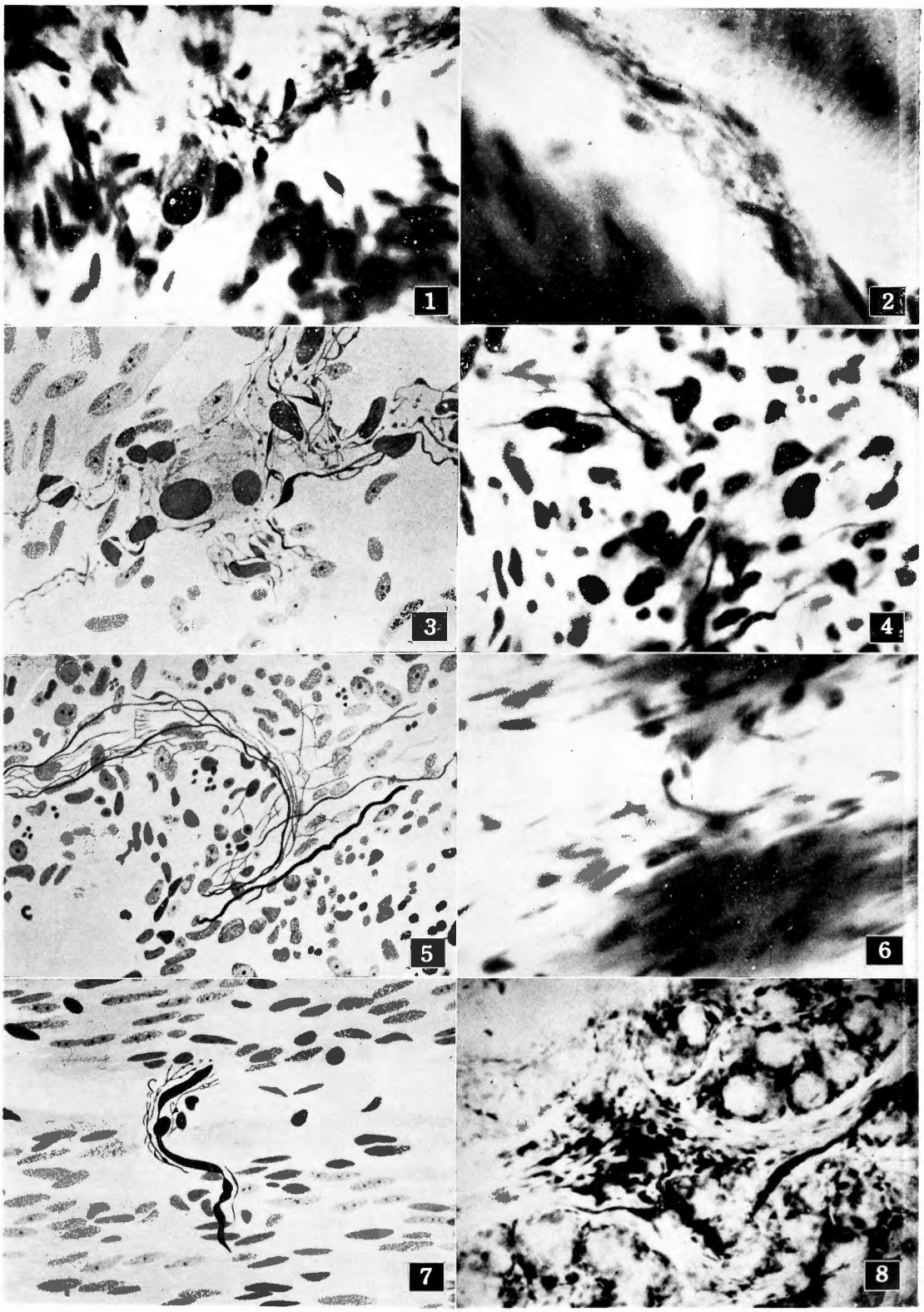
Fig. 55) A slender nerve fiber found in muscularis mucosae infiltrated by gellatinous cancer cell. Bielschowsky's silver impregnation ×400

Fig. 56, 57 & 58)
Degenerated sensory nerves in the submucous layer of a cylinder epithel carcinoma.
Bielschowsky's silver impregnation. ×400

Fig. 59) An early stage of nerve swelling found in the submucous layer of a cylinder epithel carcinoma.

Fig. 59) Cylinder epithel carcinoma. Hematoxylin-Eosin Stain.

Fig. 60) Lack of argyrophil cells in the mucous gland. Adenocarcinoma. Bielschowsky's silver impregnation.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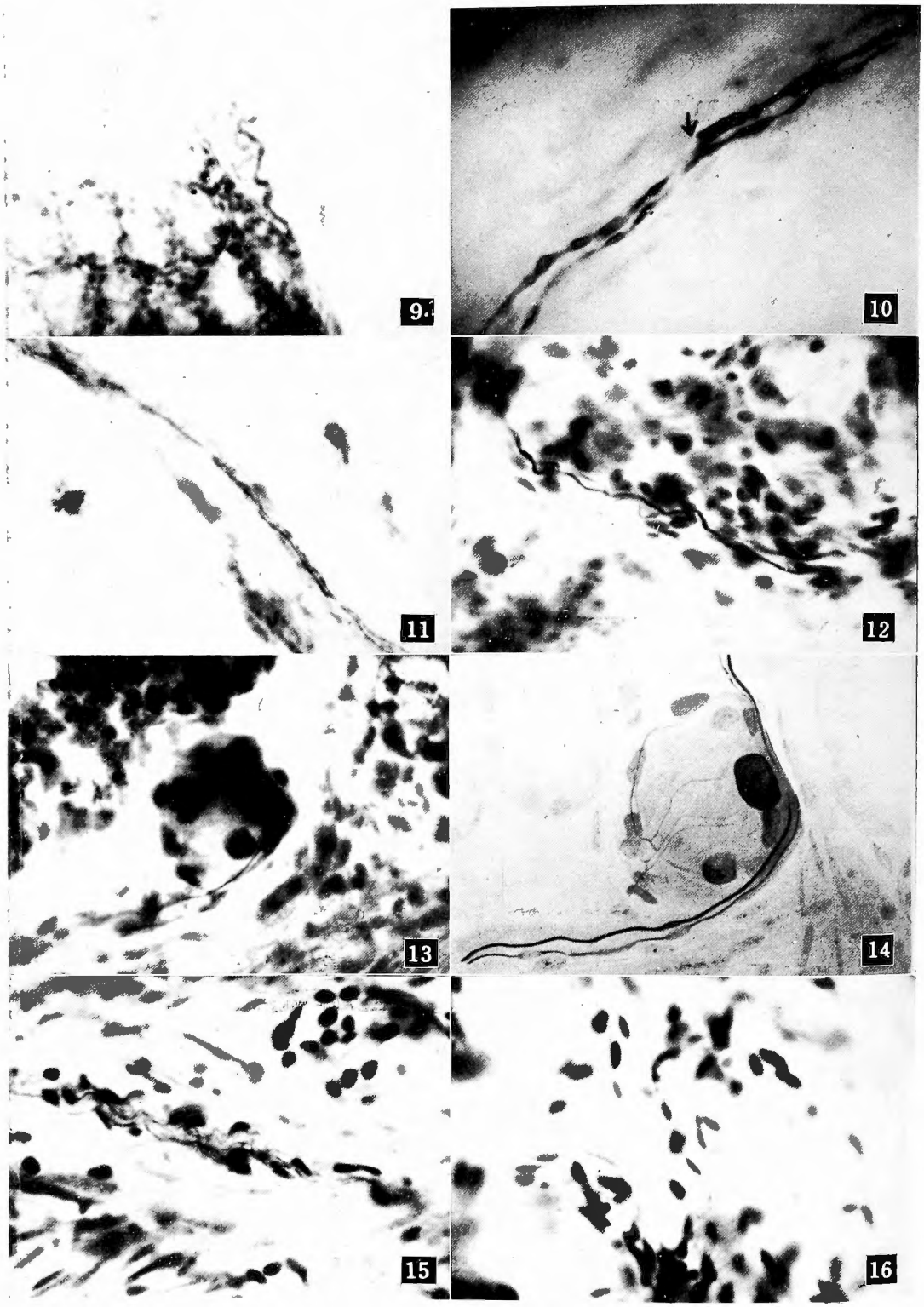

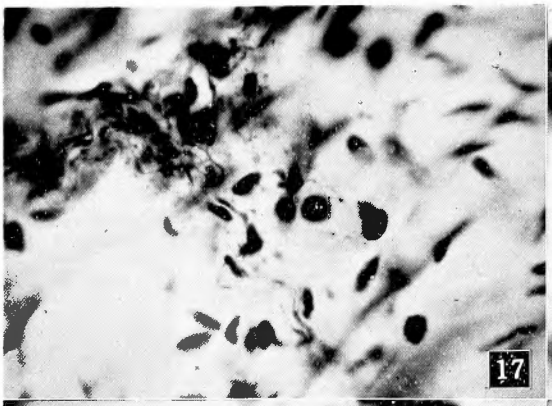
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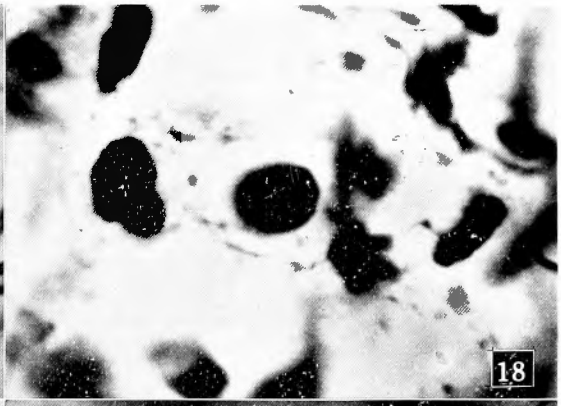
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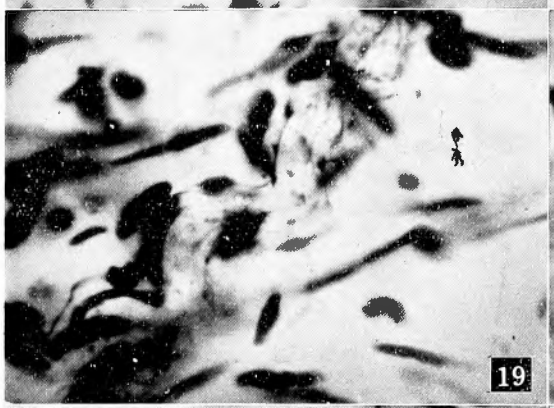
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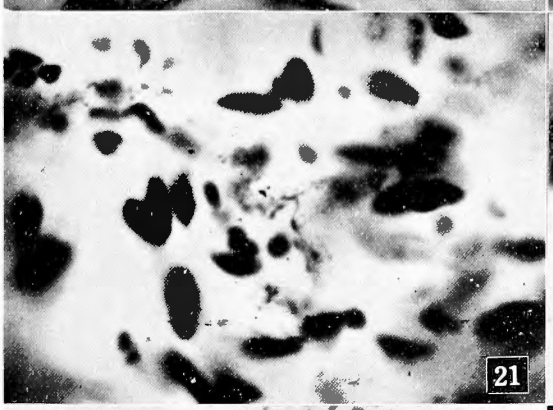
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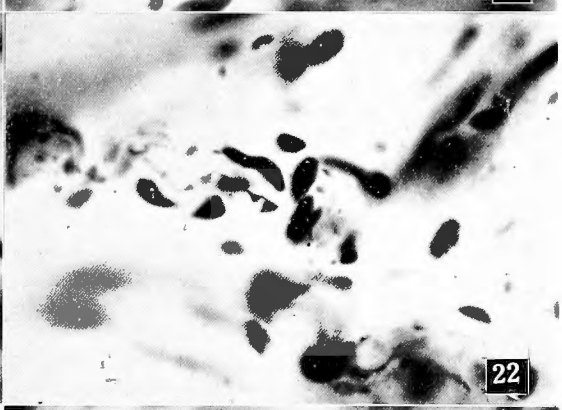
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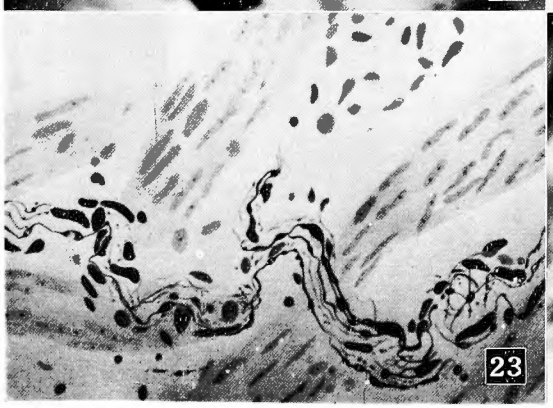
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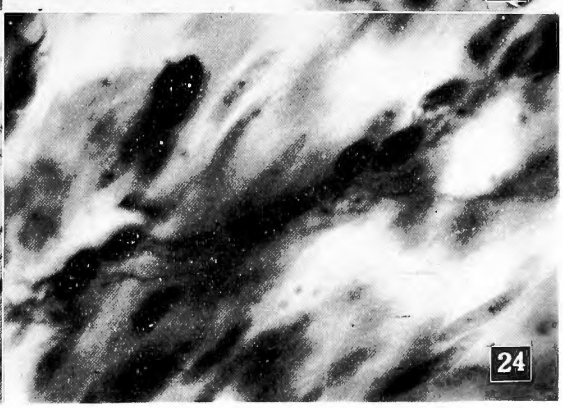
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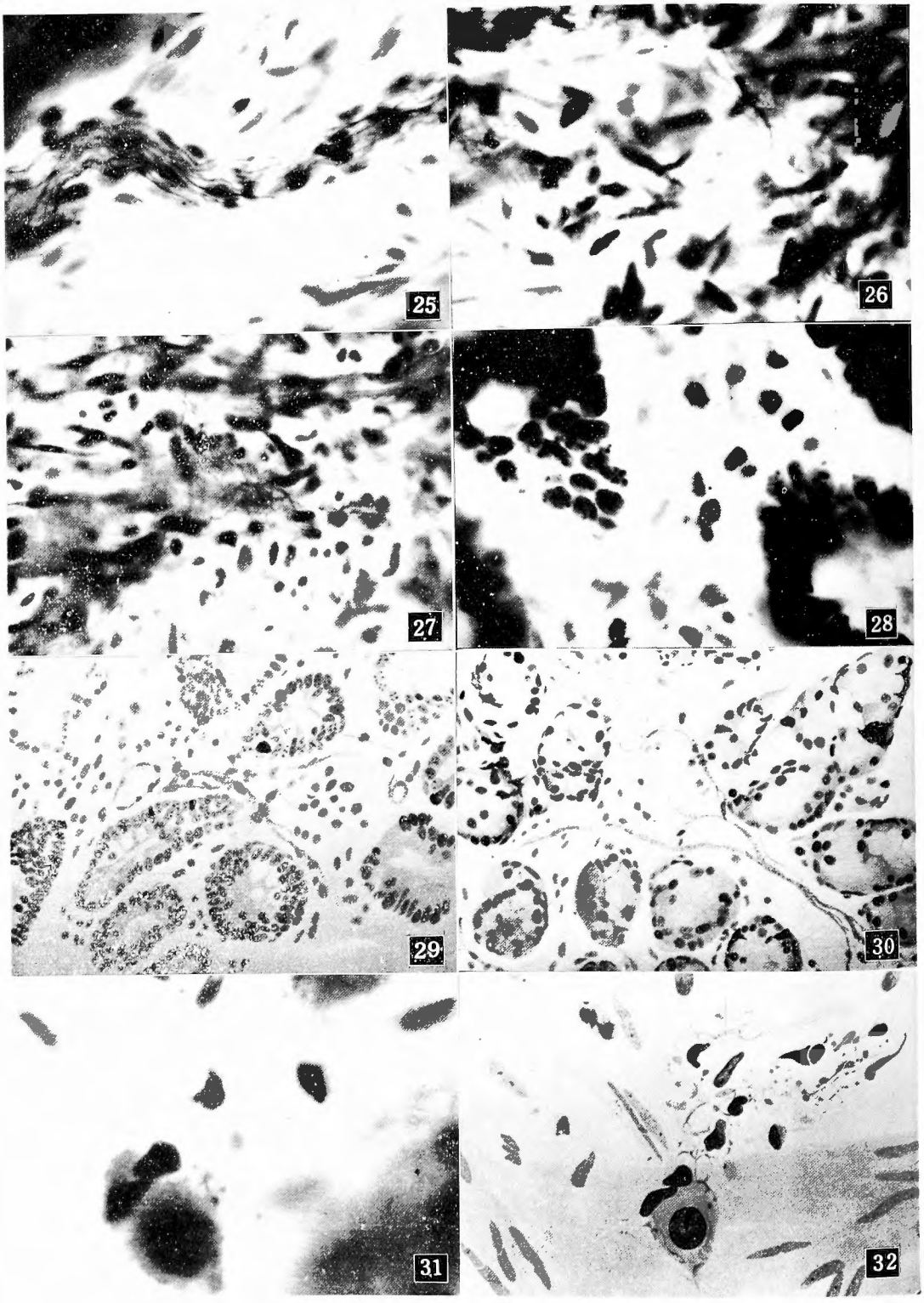
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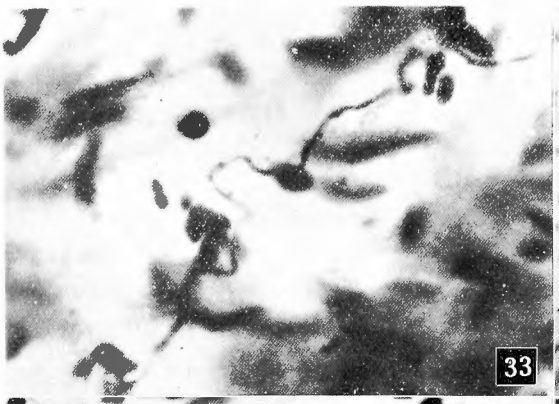
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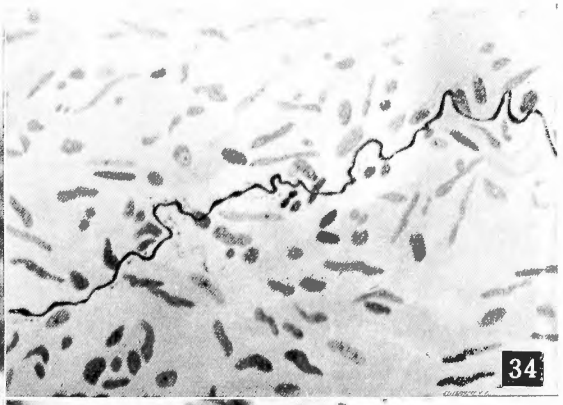
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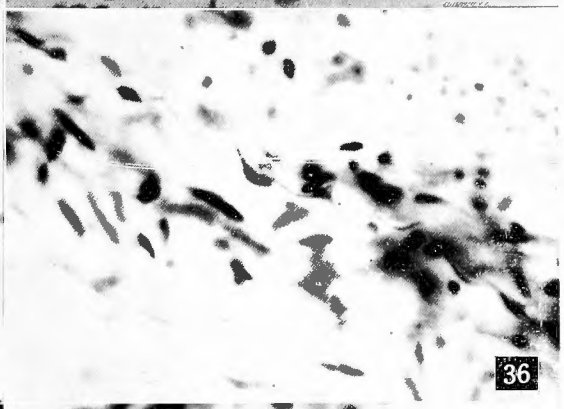
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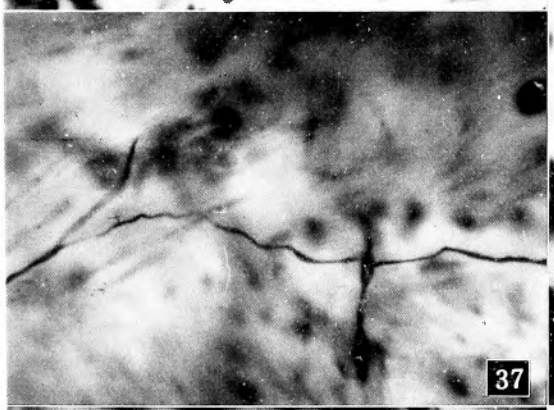
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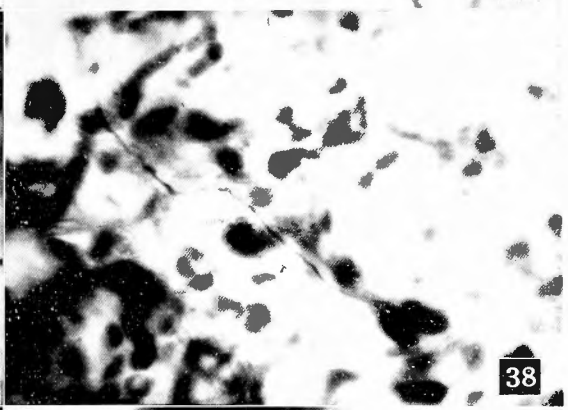
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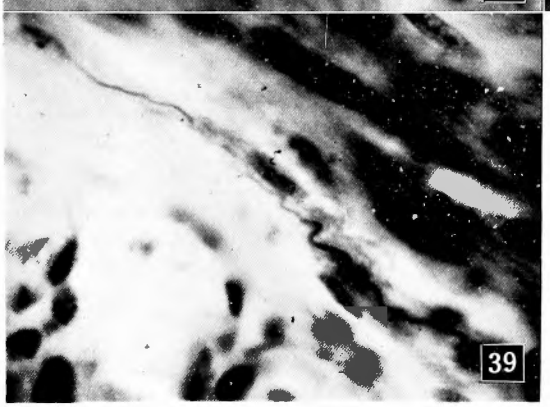
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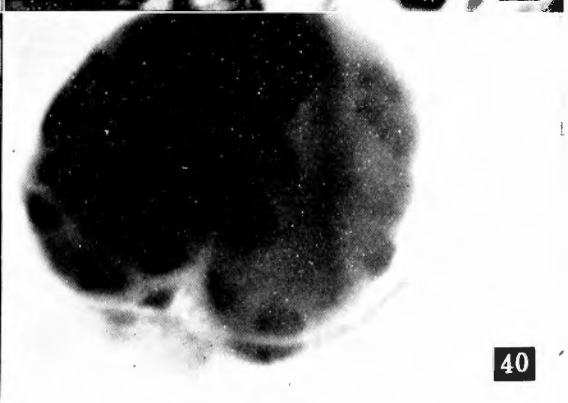
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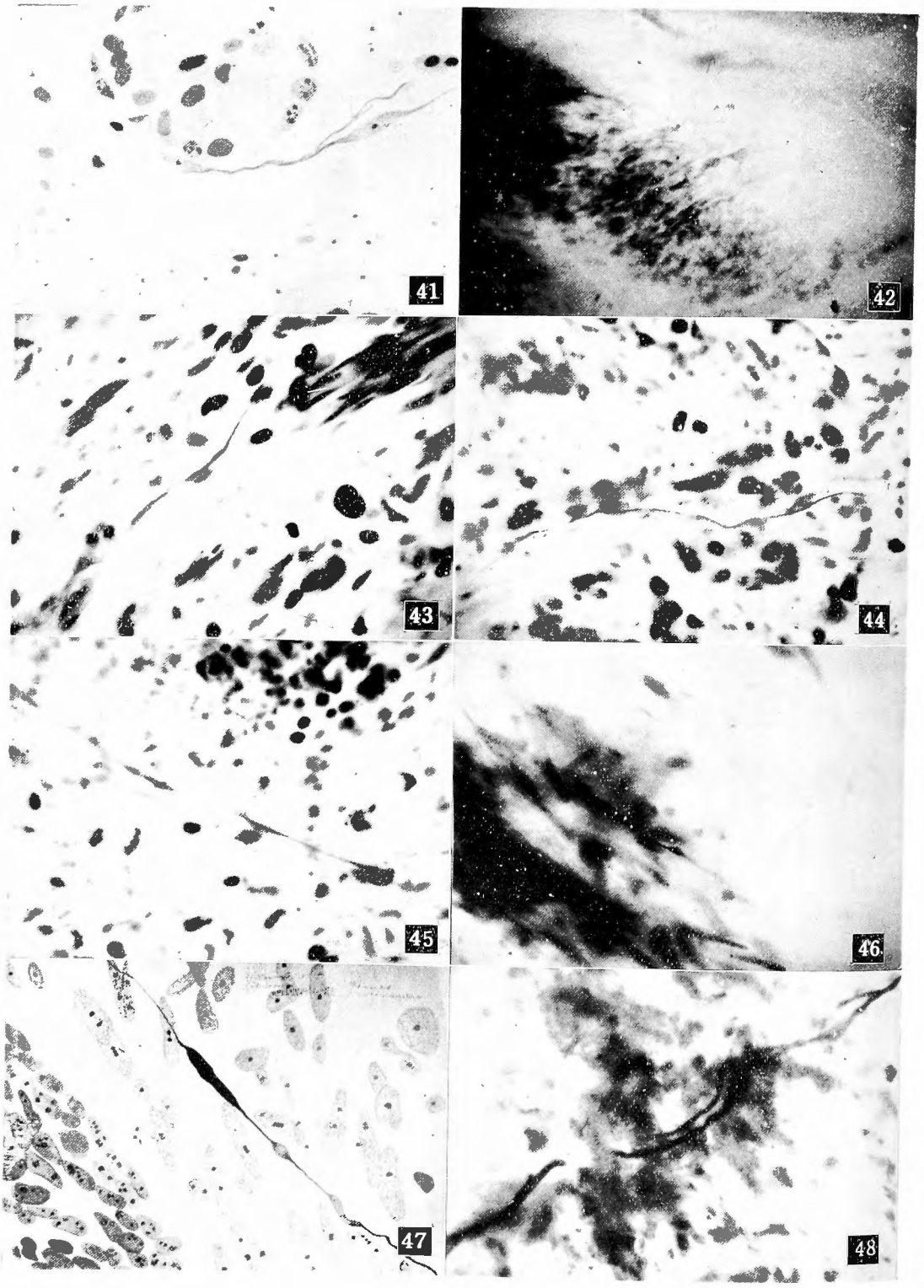
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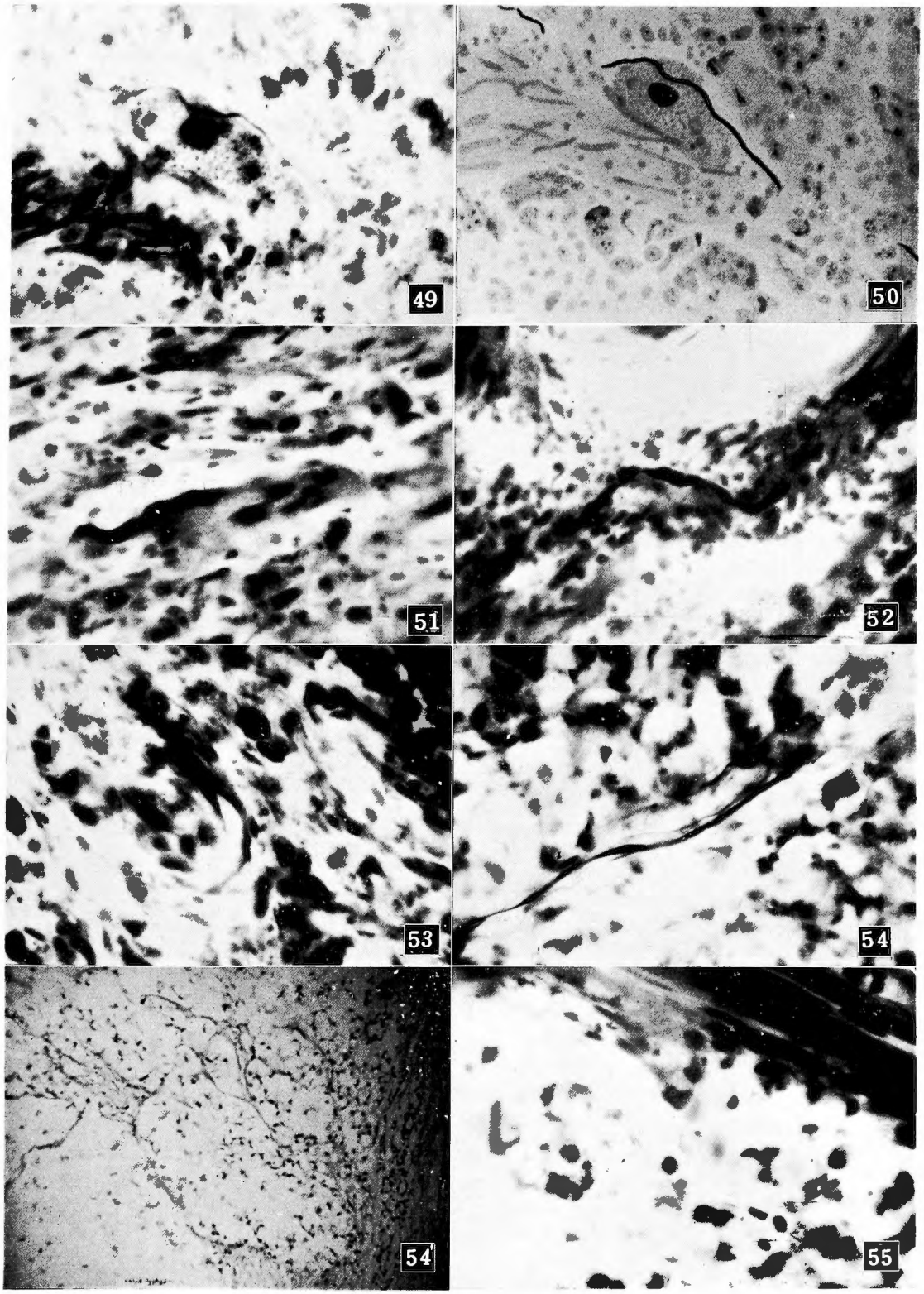
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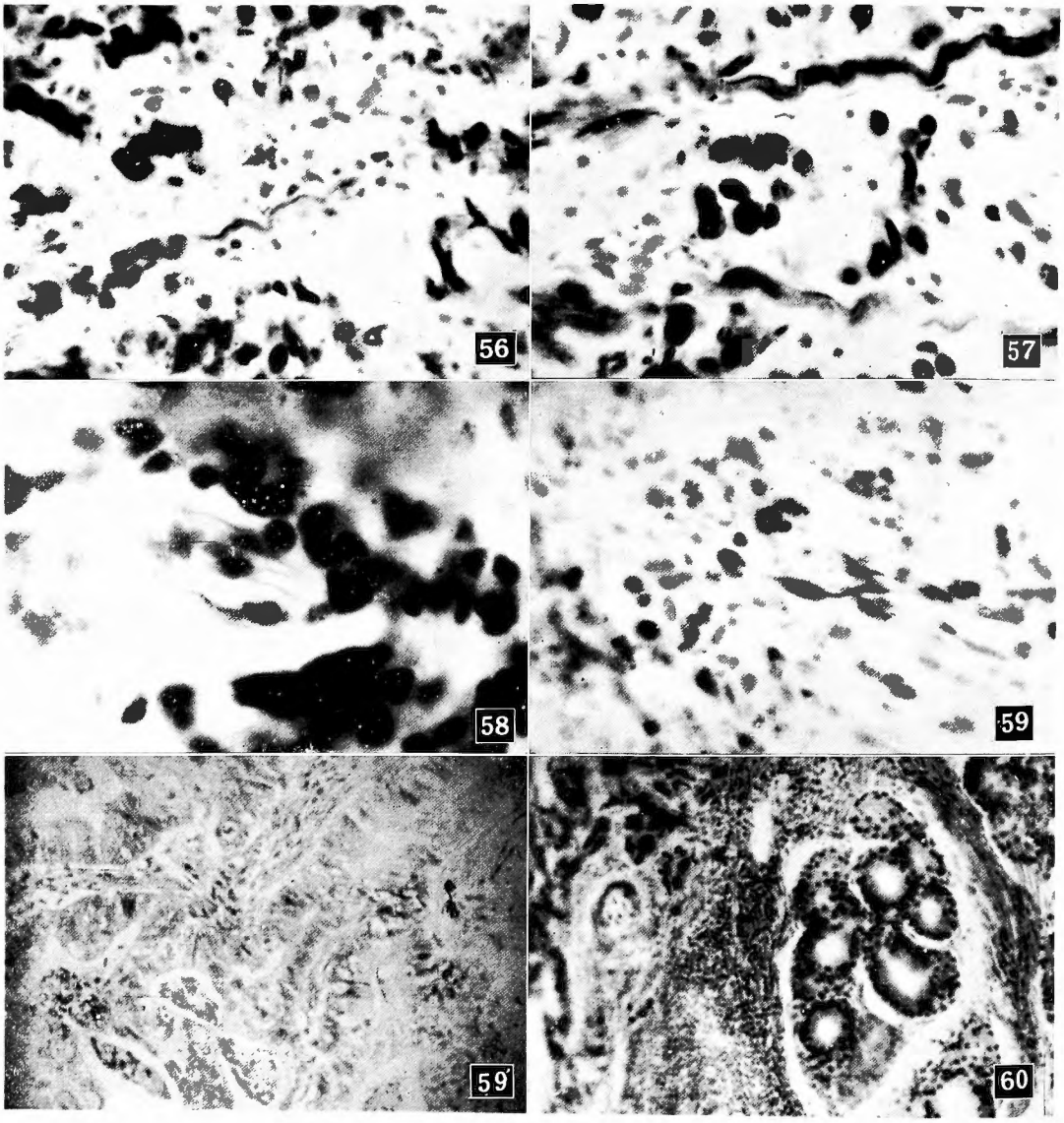
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和文抄録

慢性胃炎，胃潰瘍並に胃癌の幽門部に於ける神経病理学的研究

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慢性胃炎，胃潰瘍並に胃癌の幽門部に於ける神経の病理学部変化を追求して次の如き結果を得た．

1. 慢性胃炎及び胃潰瘍に依り常時刺戟された幽門部の神経線維は先づ肥厚又は増殖像を示し，然る後に変性に陥るがこれと同様の所見は胃癌の周辺部に於てもみられる．

2. 慢性胃炎に於ける神経増殖像は特に粘膜の自律神経網，粘膜下の Meissner 神経叢及び蛇行領域に於て著明である．

3. 胃癌の中心部に於て神経要素は著明な変性に陥るが，神経は必じも破壊消失することなく，例えば軟い膠様癌に於ては癌細胞の脱落した粗なる組織中に，神経が火線状に残つており，又硬い単順癌の場合に神経は癌胞巣を迂廻して軟い基質を撰んで走行する．

此の様な所見から癌に於ける神経の変性は主として癌細胞の圧迫に起因する栄養障害に依るものと推定された．

4. 自律神経の特殊末梢構造たる前終網，終網及び神経ジンチチウム等は癌発生の初期に於てその組織から消失する．

5. 胃粘膜に存在する嗜銀細胞は自律神経終末構造と密接な関係を有するものと考えられているが，此の嗜銀細胞は腺癌の腺構造中には見られない．

6. 慢性胃炎，胃潰瘍並に胃癌等に於て知覚神経の変化は先づ肥厚，次て膨化→空胞形成，染色性変化→断裂であり，自律神経の変化は神経ジンチチウム前終網及び終網の増殖，混濁膨化，顆粒性変化として見られ，同時に壁在神経叢中の神経細胞に種々なる変性が現われる．